METHODS

OBSERVATORY

SCIENCE AND TECHNOLOGY (ST) APPLIED SCIENCE AND TECHNOLOGY (ATS)

Teacher's Guide B First Year of Secondary Cycle Two

The programs of Science and Technology (ST) and Applied Science and Technology (AST) offer different methods for problem solving in the context of a learning and evaluation situation (LES) and elsewhere. This section presents each method in the form of a schematic flowchart to assist the student as needed in completing activities in the *Observatory* series. Double arrows placed between stages of the methods reflect their nonlinear nature; moving back-and-forth between stages at times may be necessary to successfully implement a method.

Experiment	1	
Observation	2	
Empirical m	3	
Modelling	4	
Formation o	5	
Technologic	6	
Industrial pr	7	
Part I:	Conception and design	7
Part II:	Production	8



DESCRIPTION OF METHODS AND PROGRAM OF STUDY,

Method		To be developed in		Description
		ST	AST	
Experimental method		1	1	Involves the study of reaction and interaction of variables during an experiment.
Observation method		1	1	Aims toward better understanding of a phenomenon by its observation according to set criteria.
Empirical method		1	1	Aims toward better understanding of a phenomenon by gathering and compiling data on it.
Modelling		1	1	Aims toward better understanding of an abstract phenomenon by constructing a concrete representation of it.
Formation of an opinion		1		Permits the taking of a position on a controversy by developing an argument based on scientific and technological concepts.
Technological analysis		1	1	Aims toward better understanding of an object or a system by studying its design and operation principles.
Industrial process	Conception	1	1	Aims toward conceptualizing a technical object or system that satisifes one or more identified needs.
	Design		1	Aims toward designing a conceptualized technical object or system for optimal performance, paying close attention especially to form, style and type of materials.
	Production		1	Aims toward manufacturing a conceptualized and designed technical object or system or one or more of its components.

EXPERIMENTAL METHOD

EXAMPLES OF PHASES OF SUBBESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS Lab report - Understand the problem. Goal - Formulate a goal for the experiment. **Define** - Research the concepts of science and Independent technology involved. the problem variable to be solved - If relevant, determine the variables Dependent (dependent and independent) to be variable observed and measured. Propose a reasonable explanation— Hypothesis Formulate a a hypothesis related to the target. (I believe that . . . hypothesis Justify the hypothesis. because . . . etc.) Make a list of the materials needed. List of materials - Describe in order all the steps necessary to perform the experiment. Develop an Experimental If necessary, draw a schematic diagram experimental protocol of the layout needed to perform the protocol experiment. Prepare a table of results for recording Table of results the data. Bring to mind the safety rules that apply to the experiment. Perform the Perform the experiment according experiment to the protocol described. Table of results Gather and record the data observed and measured. - Organize and classify the data Calculations collected. and diagrams - Analyze and interpret the data Data analysis Analyze results collected. and draw Reflect on the hypothesis: is it conclusions confirmed or not? Show that the goal has been reached Conclusion with the support of the scientific evidence.

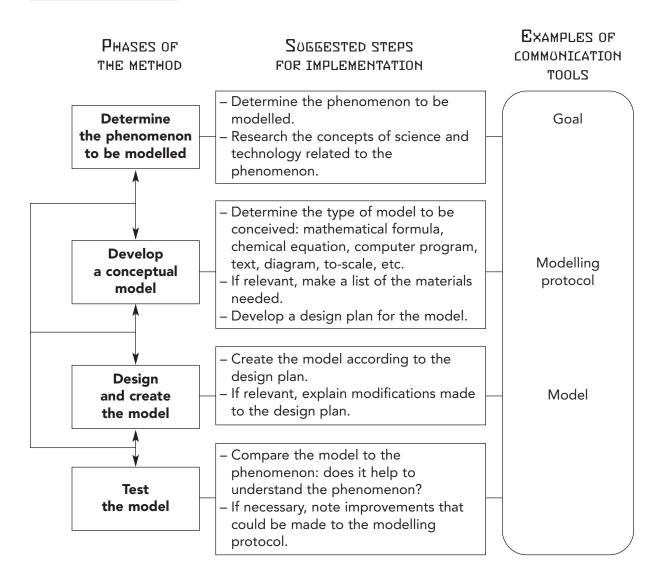
OBSERVATION METHOD

EXAMPLES OF PHASES OF SUBBESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS Observation report Understand the problem or phenomenon to be observed. Goal **Establish** - Research the concepts of science and the observation technology involved. criteria - List the elements to observe: colour, Observation structure, shape, mass, volume, etc. criteria – Determine the type of observation to be applied: sporadic, continual, fixed time, etc. Develop Identify the senses (sight, hearing, etc.) an observation Observation and the tools (magnifying glass, protocol protocol microscope, etc.) to be used. Describe the procedure to be followed to conduct the observations. Observe and note what is seen (heard, etc.)—not what seems to be seen (heard, etc.). **Implement** Table of - Gather and record the data observed. the observation observations - Organize and classify the data protocol collected; if necessary, draw a schematic diagram. - Analyze and interpret the observations collected. - If possible, compare observations with Look back on Reflection on the observation the protocol If necessary, note improvements that protocol could be made to the observation protocol.

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EMPIRICAL METHOD

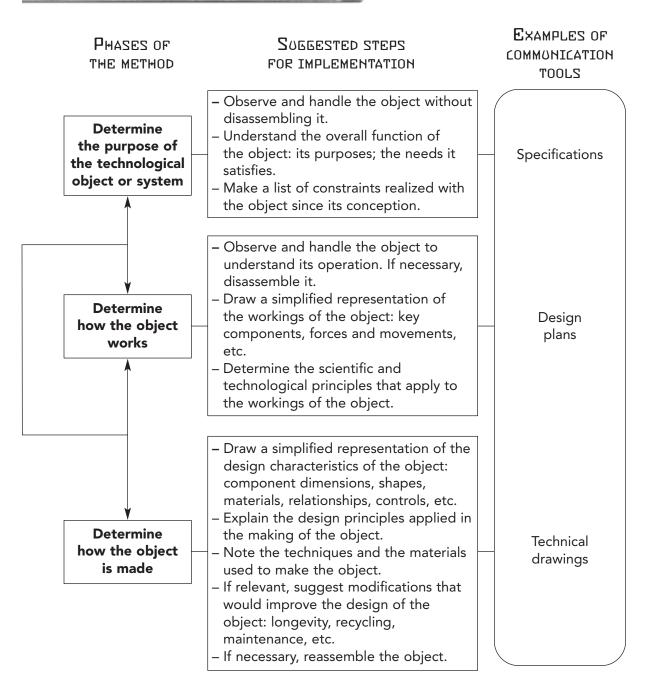
MODELLING



FORMATION OF AN OPINION

EXAMPLES OF PHASES OF SUBSESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS - Understand the subject of the controversy. - Identify factors contributing to the Goal controversy: economic, social, Identify scientific, etc. the controversy – Express an initial personal viewpoint and express a personal on the controversy. - Explain a personal involvement in viewpoint or associated values the controversy: direct, indirect, - Recognize the beliefs and values that may influence an opinion. Books, resource - Consult different sources of persons, websites, information. television and radio - Gather and write down information Gather shows, newspapers, on the elements of the controversy. information etc. - Evaluate the credibility of the Rubric for credibility information collected. of information - Analyze the information collected in relation to the controversy. Form an opinion on the controversy based on the information collected, Text of opinion **Form** taking into consideration personal or debate an opinion beliefs and values. - Justify the opinion and develop a solid argument with the information collected. - If necessary, specify the supplementary information needed to better form an opinion. Look back Acknowledge the expertise of those on the opinionwho have contributed to the forming protocol formation of the opinion. - Indicate if the opinion has evolved. If yes, specify why.

TECHNOLOGICAL ANALYSIS



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EXAMPLES OF PHASES OF SUBSESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS Identify the need to be satisfied for the product Identify to be designed. **Specifications** a need - Consult the book of specifications or make a list of the constraints to be respected. Research the concepts of science and technology related to the design solution. - Research and analyze related products already on Choose an the market. approach solution - Imagine and propose different approach solutions. Choose the approach solution that best answers the need to be satisfied and the constraints to be respected. **Establish** Draw a simplified representation of the working Design the working principles of the product. plans principles - Draw a simplified representation of the manufacturing solution for the product: component dimensions, materials, connectors, controls, etc. - Optimize the workings and the appearance of the product by seeking the best adapted materials, Establish the Technical the most efficient assembly, the most appealing manufacturing drawings, solution colours, the most ergonomic shapes, etc. sketches - Choose the techniques to apply in manufacturing the product. - Make a list of the materials needed for manufacturing the product. - Make a prototype applying the design and manufacturing solutions. - Test the prototype to verify its functioning. Make a Prototype - Ensure the prototype satisfies the need identified prototype and respects the constraints listed. If necessary, suggest improvements to be made. Move to production Legend: applies only to design

INDUSTRIAL PROCESS

Part II: PRODUCTION

